Connectedness and SME Financing in Post-Communist Economies: Evidence from Uzbekistan

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Online Appendix

Appendix 1: Data Source and Construction

Table A1 shows how per capita output varies in the 14 administrative regions in Uzbekistan. The city of Tashkent is the most prosperous administrative region, with per capita output more than two and a half times higher than the national average; the only other region that enjoys similar levels of prosperity is Navoiy, with its concentration of the country's largest gold mining corporations.

To capture any possible differences in business environments which may influence enterprises' access to and use of formal finance, the primary data sample of 502 SMEs is drawn from the core capital city region (301 observations) and two other regions, the Tashkent region (101 observations) and the Ferghana region (100 observations). Self-employed private entrepreneurs, enterprises providing financial services, and enterprises with more than 100 employees were excluded from the sample.

Table A1. Distribution of National Output Across Regions in Uzbekistan, 2010

	Annual Output, Billion *Soums*	Population, Million (2009)	Output per Capita, Thousand *Soums*
Karakalpakstan	1389.8	1.62	856.26
Namangan	2426.6	2.24	1084.22
Surkhandarya	2229.3	2.05	1085.13
Samarkand	3813.1	3.09	1233.73
Djizhak	1389.1	1.11	1253.93
Khorezm	1944.1	1.55	1257.34
Ferghana	4095.5	3.05	1343.36
Syrdarya	1008.3	0.71	1423.35
Andizhan	3679.6	2.52	1457.50
Kashkadarya	4865.1	2.59	1878.71
Bukhara	3376.0	1.60	2109.08
Tashkent Region	5571.1	2.57	2168.76
Navoiy	3276.6	0.85	3876.26
City of Tashkent	9820.1	2.22	4422.07
Uzbekistan	48884.3	27.77	1760.51

Source: Statistical Review of the Republic of Uzbekistan (2010)

Use of the State Register of Enterprises and Organisations as a sampling source was impractical because of the infrequency of its updating, so it was impossible to ascertain whether some of the listed enterprises had moved premises or had gone out of business. Instead, the sample was drawn from local business directories, using a stratified random sampling approach. To obtain representative samples from each sector of the economy we chose 40 per cent of the observations from the manufacturing and construction sectors, 30 per cent from the services sector, 20 per cent from the trade sector, and 10 per cent from the agricultural sector. Agriculture was accorded a lower weighting because production quotas, price controls, and subsidised credits are still common in the sector, and it remains one of the least reformed parts of the economy (Lerman, 2008). The survey questionnaire was piloted in November 2010 and, after making appropriate modifications, the full survey was carried out in December 2010 using face-to-face interviews, with 20 per cent of the respondents contacted by telephone later on for quality control purposes.

Appendix 2: Bribe Models

Table A2 shows the results of models estimating the probability of offering bribe for the full sample (Model 4) and a sub-sample conditional upon applying for formal credit (Model 5). Focussing on Model 5, coefficients of the variables *age, age22, educ, cash1, and expnd_d* are all statistically significant. As for the interpretation of the signs of these variables, the results imply that: youngest and oldest SME owners, better educated SME owners, and SMEs facing payments system problems are more likely to bribe the officials; and the probability of offering bribe falls as sales revenues (*expnd_d)* increases. These, combined with the fact that, although insignificant, *lnsales* also has a negative sign, imply that firm size and superior firm characteristics reduce probability of offering bribe to public officials. Further, with respect to *cash1*, it is more practical for larger SMEs to effect most of their input and wage payments, and also get paid for their outputs, through their bank accounts. In other words, since it is the smaller SMEs that face payments problems the most, the observed positive sign of *cash1* re-enforces our conclusion about the importance of firm size. Hence, these results shed further light as to why the bribe variable might be insignificant in our main estimations (although this does not seem to deter the sampled SMEs from enthusiastically applying for formal credit as evidenced by the statistical significance of *bribe* in the credit application model as shown in Model 6 in Table A2).

Appendix 3: Models for Business Expansion

Results of the models for business expansion are reported in Table A3. In Model 7 and Model 8, the dependent variable takes the value of 1 if SMEs expressed a need for external finance, which is used here as a proxy for enterprises' growth potential, and 0 otherwise. Model 7 uses all available observations, while Model 8 uses observations conditional upon SMEs undertaking business expansion since their inception. The dependent variable in Model 9 takes the value of 1 if SMEs undertook investment in business expansion since their inception, 0 otherwise. Of the three proxies for interpersonal connections, only the coefficient of *bzinbrpl* is statistically significant in all three models. The main target variable *gov_connect* has the expected positive sign in all three models, but is not statistically significant in any of them.

Appendix 4: Further Checks for Model Specification and Robustness of the Results

An alternative approach for dealing with the self-selection issue, particularly when conditional subsamples cannot be drawn, is to use more sophisticated maximum likelihood estimators such as the Heckman-type probit model. This estimates the credit use and credit application equations jointly,

Table A2. Probability of Offering Bribe and Applying for Formal Finance (Logit Coefficients with Standard Errors)

Predictors	Model 4	Model 5	Model 6
Constant	1.48	7.63	–7.37***
	(2.26)	(4.7)	(2.50)
Age	–0.09	–0.36*	0.20**
	(0.08)	(0.19)	(0.09)
age22	0.08	0.40*	–0.25**
	(0.09)	(0.22)	(0.11)
busness_exper	0.002	0.01	0.04
	(0.03)	(0.05)	(0.03)
busness_exper22	0.008	0.01	–0.07
	(0.04)	(0.08)	(0.04)
Educ	0.05	0.12**	–0.05
	(0.05)	(0.07)	(0.04)
lnsales	–0.02	–0.13	0.16**
	(0.08)	(0.14)	(0.08)
expnd_d	–0.37	–0.93**	0.88***
	(0.25)	(0.45)	(0.28)
cash1	0.56**	1.19***	–0.07
	(0.27)	(0.45)	(0.28)
gender	0.39	0.72	0.27
	(0.34)	(0.56)	(0.35)
tash_obl	–0.05	0.03	0.01
	(0.33)	(0.53)	(0.34)
fergh	–1.46***	–0.73	–0.78**
	(0.40)	(0.64)	(0.39)
agri	0.28	-0.46	0.22
	(0.47)	(0.71)	(0.45)
srvs	–0.18	0.19	–0.94***
	(0.36)	(0.68)	(0.38)
trd	–0.49	–0.81	0.36
	(0.41)	(0.61)	(0.39)
gov_connect	0.01	–0.28	0.61**
	(0.31)	(0.48)	(0.30)
Bribe	–	–	0.61**
			(0.27)
bzinbrpl	–0.17	0.03	0.53*
	(0.30)	(0.53)	(0.32)
Overall Model Evaluation and Tests			
	χ^2(d.f.)	χ^2(d.f.)	χ^2(d.f.)
Log-likelihood value	–199.65	–80.40	–197.78
Likelihood ratio test	33.97***	24.78***	53.80***
Pseudo R squared	0.08	0.13	0.12
Hosmer and Lemeshow Goodness-of-fit test	3.12 (8)	7.78 (8)	5.14 (8)
Correctly predicted	67.80%	68.38%	68.07%
Number of Observations	332	136	332

Notes: Models estimated using Stata 11; coefficient standard errors are reported in brackets; *** refers to significant at 1 per cent, ** significant at 5 per cent, and * significant at 10 per cent levels respectively. In Models 4 and 5, the dependant variable takes the value of 1 if SME senior manager ever offered bribe to government officials to get things done, 0 otherwise; Model 5 includes observations conditional upon applying for credit only. In Model 6, the dependant variable takes the value 1 is SMEs applied for formal finance, 0 otherwise.

also assuming the joint normality of their error terms and non-zero correlation (ρ) between them (Cavaluzzo et al. 2002; Cavaluzzo and Cavaluzzo, 1998). If the latter condition is not satisfied, that is ρ=0, the results from general models are considered unbiased and consistent (Wooldridge, 2002).

Table A3. Probability of Undertaking Business Expansion and Needing Formal Finance (Logit Coefficients with Standard Errors)

Predictors	Model 7	Model 8	Model 9
Constant	–2.73	–1.98	–6.40
	(2.22)	(2.75)	(2.51)
Age	0.13	0.11	0.08
	(0.08)	(0.10)	(0.09)
age22	–0.15	-0.14	–0.08
	(0.09)	(0.11)	(0.09)
busness_exper	0.02	0.01	0.04
	(0.03)	(0.04)	(0.05)
busness_exper22	–0.08	–0.10	–0.04
	(0.06)	(0.09)	(0.05)
Educ	–0.01	0.01	0.01
	(0.04)	(0.05)	(0.05)
lnsales	0.01	–0.02	0.24***
	(0.08)	(0.10)	(0.10)
expnd_d	–0.31	–0.56*	0.41
	(0.25)	(0.31)	(0.29)
cash1	0.46*	0.40	0.45
	(0.26)	(0.33)	(0.30)
gender	0.20	0.47	–0.06
	(0.32)	(0.40)	(0.37)
invstd	0.48*	–	–
	(0.28)		
tash_obl	–0.65**	–0.50	1.02**
	(0.33)	(0.39)	(0.42)
fergh	0.19	0.57	0.40
	(0.36)	(0.46)	(0.40)
Agri	–0.28	–0.18	–0.42
	(0.44)	(0.53)	(0.51)
srvs	–0.64*	–0.87	0.10
	(0.35)	(0.42)	(0.39)
trd	0.07	–0.19	–0.82**
	(0.39)	(0.51)	(0.41)
gov_connect	0.14	0.21	0.31
	(0.29)	(0.35)	(0.35)
bribe	0.25	0.40	0.48
	(0.26)	(0.31)	(0.30)
bzinbrpl	0.56*	0.88**	0.64*
	(0.30)	(0.37)	(0.35)
Overall Model Evaluation and Tests			
	χ^2(d.f.)	χ^2(d.f.)	χ^2(d.f.)
Log-likelihood value	–211.80	–147.32	–172.75
Likelihood ratio test	35.44(18)***	38.77(17)***	40.51(17)***
Pseudo R squared	0.08	0.12	0.11
Hosmer and Lemeshow Goodness-of-fit test	6.45 (8)	5.54 (8)	3.97 (8)
Correctly predicted	62.35%	64.61%	73.49%
Number of Observations	332	243	332

Notes: Models estimated using Stata 11; coefficient standard errors are reported in brackets; *** refers to significant at 1 per cent, ** significant at 5 per cent, and * significant at 10 per cent levels respectively. In Models 7 and 8, the dependant variable takes the value of 1 if SMEs express need for external finance, 0 otherwise; Model 7 includes all of the available observations in the sample; Model 8 uses only observations if SMEs undertook business expansion. In Model 9, the dependant variable takes the value 1 is SMEs invested in business expansion, 0 otherwise.

However, estimation of this model requires identification of a variable that affects the probability of credit application in the selection model, but does not belong to the main of model credit use in its own right. Unfortunately the choice of instruments available for this variable in our dataset is limited. The most promising variable is the response to the question about *'low demand for products'*, which could be interpreted as a measure of overconfidence (or risk aversion); we conjecture that, due to asymmetric information problems, banks' knowledge of the actual nature of market demand for enterprises' products is always less than that of the borrowers. Since most enterprises suffering from low demand for their products will select themselves out from applying for formal credit, enterprises that suffer more from low demand for their products but still apply for formal credit can be described as overconfident if they are unconcerned about the possibility that banks may find this out. For example, 187 enterprises in the sample complained of low demand for their products being 'important' or 'very important' problem, but 54 of these still applied for formal credit. Although the smaller proportion of these SMEs applied for formal credit (29% compared to 42% of the counterpart group), more than half of them were not detected by banks. Hence the variable, coded 1 if enterprises reported this factor as an 'important' or 'very important' obstacle to the operation and growth of their businesses and 0 otherwise, was included in the credit application part of the model. The results of the model, which are reported in Table A4.1 show that the coefficient of the target variable *gov_connect* and that of *bzinbrpl* are statistically significant at 5 per cent level. Although the instrumental variable in the selection equation is statistically significant at around 2 per cent, and the null hypothesis of 'no systematic difference between the coefficients of general and Heckman models' (the Hausman test) is also rejected at less than 1 per cent level of significance, the correlation coefficient between the error terms of the main and selection equations is statistically significant only at 13 per cent. Nevertheless, the results from the Heckman model are not fundamentally different from those obtained using univariate models. For example, once converted into logit coefficient using rough guides, for example 0.54x1.6=0.86 (from which an odds ratio of 2.37 can also be derived), the estimated magnitude of the *gov_connect* coefficient is also comparable to those obtained in logit models in Table 4 in the main text. Incidentally, this observation is in line with the findings of Cavalluzzo et al. (2002) and Muravyev et al. (2009) who, despite having a somewhat richer dataset, did not find fundamentally different results in their estimations of Heckman-type models. The findings, however, are not suggestive of the absence of selection problems as the similarity of the estimates with and without selection correction may also be the result of statistical problems (Kennedy, 2003, p. 291; Wooldridge, 2006, pp. 609–11) and/or because the instrument of our choice is not strong enough.

The missing variable problem is another issue that may affect results, particularly differences in the creditworthiness of enterprises, including detailed data on entrepreneurs' personal wealth. Banks usually require carefully drafted business plans and feasibility studies from SMEs when considering their loan applications, along with historic financial performance indicators. They also consider the personal wealth of business owners that can be drawn upon should the company finances deteriorate significantly. Variables already included, such as owner age, business experience and education, will capture at least some of the features of creditworthiness, personal wealth, and entrepreneurial drive and skill. But, incomplete characterisation of these factors may still have potential impact on our results. There is also a possible measurement error with the gender term, which is statistically insignificant and has a counter-intuitive positive sign in Models 1, 2, and 3. Some studies investigating gender discrimination in SME finance such as Cavaluzzo et al. (2002) and Muravyev et al. (2009, see also Blanchard et al., 2008) show that Models 2 and 3 can deal with negative discrimination and positive selection effects with respect to the gender term by providing the upper and lower bounds of gender discrimination, which both papers find to be negative and statistically significant in relation to the United States and international SME finance data respectively. In our view, the gender term may be insignificant in our estimation due to a lack of credibility of bureaucratic institutions in protecting private property rights. Because of a fear of possible misappropriation, Uzbek businessmen are known to commonly register titles of their high value properties such as houses, cars, and sometimes even

Table A4.1. Credit Use: Probability of Holding a Formal Credit (Heckprobit Coefficients with Standard Errors)

Predictors	Main Model: Credit Use	Selection Model: Credit Application
Constant	–6.21***	–4.23***
	(2.26)	(1.48)
Age	0.15*	0.13**
	(0.09)	(0.06)
age22	–0.17*	–0.15**
	(0.11)	(0.07)
busness_exper	0.04*	0.03*
	(0.02)	(0.02)
busness_exper22	–0.07*	–0.05*
	(0.04)	(0.03)
Educ	–0.04	–0.02
	(0.04)	(0.03)
lnsales	0.13*	0.08*
	(0.07)	(0.05)
expnd_d	0.48**	0.49***
	(0.23)	(0.17)
cash1	–0.52**	–0.05
	(0.26)	(0.17)
gender	0.18	0.17
	(0.27)	(0.21)
tash_obl	0.47	0.08
	(0.30)	(0.21)
fergh	0.07	–0.36
	(0.36)	(0.24)
Agri	–0.74*	–0.02
	(0.45)	(0.28)
srvs	–0.73**	–0.54**
	(0.32)	(0.23)
trd	0.14	0.17
	(0.29)	(0.24)
gov_connect	0.54**	0.36*
	(0.24)	(0.18)
bribe	0.18	0.39***
	(0.22)	(0.16)
bzinbrpl	0.52*	0.33**
	(0.26)	(0.20)
lw_dmd_dum	_	–0.36**
		(0.15)
Likelihood ratio test of the independence of equations (ρ=0)		χ^2(d.f.)
		2.68 (1)
Heckman test for the absence of systematic difference between the coefficients of univariate and bivariate models		62.63 (17)***
Overall Model Evaluation and Tests		χ^2 (d.f.)
Log-likelihood value		–269.52
Likelihood ratio test		35.05 (17)***
Number of Observations		331

Notes: Models estimated using Stata 11; coefficient standard errors are reported in brackets; *** refers to significant at 1 per cent, ** significant at 5 per cent, and * significant at 10 per cent levels respectively.

their businesses, in the name of their close relatives, these often being female. Hence, the insignificance of the gender term may not necessarily indicate absence of gender discrimination as the sample of female SME owners used in this study may not be fully representative of the female entrepreneurs in the SME population.

Consequently, the approach proposed by Blanchflower et al. (2003) and Muravyev et al. (2009) of carrying out several further regression estimations on various sub-samples is used. First, the sample is divided according to enterprise size and age, respectively. Larger and more established enterprises are likely to rely on businesses' rather than owners' resources to repay obligations. In terms of enterprise size, two sub-samples are identified: SMEs with less than 10 employees and those with more than 10 employees, respectively. As for SME age, the first sub-sample includes SMEs established less than four years ago, with the rest of the available observations in the second sub-sample. Second, the dataset contains a variable which measures respondents' subjective evaluation of their access to bank credit from 1 to 5: 1 being very easy and 5 very difficult. Since wealthier business owners are less likely to be constrained by a lack of external finance, they are also less likely to complain about access to bank credit. Therefore, again the data is split into two sub-samples: the first sub-sample contains SMEs with 'very easy' and 'easy' responses, and the second contains the rest.

The estimation results from these sub-samples are reported in Table A4.2. Models 1, 2, and 3 in Table A4.2 are identical to those reported in Table 4 in the main text; for brevity, only results of the main target variable *gov_connect*, are reported. This shows that the sign of the government connections variable is correctly predicted in all estimations. The magnitudes of the coefficients are not radically different in most of the estimations, with the exception of Model 2 in Panel A and Panel C. It

Table A4.2. Probability of Holding Formal Credit: Estimation Results from Sub-samples

	Model 1		Model 2		Model 3	
Panel A. Enterprise size sub-samples						
	More than 10 employees	Less than 10 employees	More than 10 employees	Less than 10 employees	More than 10 employees	Less than 10 employees
gov_connect	*0.996**	*0.543*	*0.064*	*1.570*	*0.835*	*0.615*
	(0.573)	*(0.551)*	*(0.951)*	*(0.989)*	*(0.747)*	*(0.735)*
N. Obs.	135	196	67	68	72	92
Panel B. Enterprise age sub-samples						
	5 years or above	4 years or under	5 years or above	4 years or under	5 years or above	4 years or under
gov_connect	*1.243***	*1.061*	*1.096*	*0.932*	*1.205**	*0.808*
	(0.502)	*(0.667)*	*(0.705)*	*(1.171)*	*(0.622)*	*(0.953)*
N. Obs.	182	149	53	82	97	78
Panel C. Access to financing sub-samples						
	Access Easy	Access Difficult	Access Easy	Access Difficult	Access Easy	Access Difficult
gov_connect	*1.000*	*0.562*	–	*0.765*	*1.371*	*0.496*
	(0.878)	*(0.468)*		*(0.631)*	*(1.330)*	*(0.548)*
N. Obs.	64	244	16	94	34	141

Notes: Models 1, 2, and 3 are identical to those reported in Table 4 in the main text; for brevity, only the results of the target variable, government connections, are reported. Panel A reports the estimates from sub-samples split on the basis of enterprise size, Panel B from sub-samples split on the basis of enterprise age. For Panel C, the sample is split on the basis of enterprises' subjective evaluation of their access to formal finance. No result is reported for Model 2 in Panel C under 'Access Easy' due to low number of observations.

*** refers to significant at 1 per cent, ** significant at 5 per cent, and * significant at 10 per cent levels respectively.

is possible that some of the observed differences might also be due to unintentional loss of observations because of missing data, especially in relation to Models 2 and 3 which already use a restricted number of observations conditional, respectively, upon application for credit, and expressing the need for credit. In general, parameter estimates of the sub-samples for larger, longer-established, and wealthier enterprises appear to be greater.

Appendix 5: Sensitivity of Marginal Effects of Main Target Variables

Table A5.1 presents marginal effects of our two key target variables, *gov_connect* and *bzinbrpl*, using marginal effects at means (MEMs) and average marginal effects (AMEs) methods. Given relative consistency of our results across various models, the model we choose here is the probability of holding formal credit conditional upon expressing need for external finance (Model 3). Using the MEMs method, the results show that for an 'average' SME with government connections, the probability of obtaining formal credit is 18 per cent higher than that for a similar SME with no government connections. And, for an 'average' SME that operates at its owner's birthplace, the probability of obtaining formal credit is 21 per cent higher. But, the drawback of the MEMs approach is that while there *can* be an SME surviving in business for 7.86 years, and whose owner is 42.09 years old, there can be no SME with *gov_connect* at 0.25 (figures are the mean values of these variables respectively). This issue can be dealt with by using the AMEs approach, which uses the actual observed values for the dummy variables for the entire sample when computing a predicted probability for each observation, and then averages the predicted values. The method in effect compares two hypothetical populations which have the same values on the other independent variables in the model (Williams, 2012, p. 323). As can be seen from the fourth column of Table A5.1, the AME methods produces results which are only marginally different from those reported using the MEM approach in the second column of Table A5.1.

But, since all the data, not just the means, are used in the calculation of marginal effects, even the AMEs is not free from criticism (Cameron and Trivedi, 2010). So, to complement the shortcomings of the MEMs and AMEs methods, we also check the sensitivity of our main results using representative values of two key covariates, that is *lnsales* (proxy for SME size) and *cash1* (proxy for cash/payment system problems). These results are reported in Tables A5.2 and A5.3. The results from Table A5.2

Table A5.1. Marginal Effects of *Gov_connect* and *Bzinbrpl* using Marginal Effects at Means (MEMs) and Average Marginal Affects Methods.

	MEMs		AMEs	
	Marginal Effects	p-value	Marginal Effects	p-value
Gov_connect	0.18	0.07	0.15	0.06
Bzinbrpl	0.21	0.00	0.20	0.00

Table A5.2. Marginal Effects of *Gov_connect* and *Bzinbrpl* Given Representative Values of *Lnsales*.

	Gov_connect		*Bzinbrpl*	
Representative Values of Lnsales:	Marginal Effects	p-value	Marginal Effects	p-value
Minus 1 s.d. from the mean	0.13	0.07	0.16	0.01
Mean	0.16	0.06	0.20	0.00
Plus 1 s.d. from the mean	0.17	0.05	0.24	0.01

Table A5.3. Marginal Effects of *Gov_connect* and *Bzinbrpl* Given Representative Values of Lnsales and Cash1 Variables.

	Cash1 = 1		*Cash1 = 0*		
Representative Values of Lnsales:	Marginal Effects	p-value	Marginal Effects	p-value	Difference between the two M.E.s
Panel I. *Gov_connect*					
Minus 1 s.d. from the mean	0.12	0.09	0.17	0.06	0.05
Mean	0.15	0.07	0.18	0.05	0.03
Plus 1 s.d. from the mean	0.17	0.06	0.18	0.04	0.01
Panel II. *Bzinbrpl*					
Minus 1 s.d. from the mean	0.13	0.01	0.23	0.01	0.10
Mean	0.18	0.00	0.27	0.01	0.09
Plus 1 s.d. from the mean	0.22	0.00	0.29	0.01	0.07

indicate how much the marginal impact of *gov_connect* and *bzinplbr* on holding formal credit changes when the values of *lnsales* move one standard deviation (s.d.) from its mean value. Results show that magnitude of marginal effects of both variables increases as the values of *lnsales* go up, confirming our earlier observation that the importance of interpersonal connections strengthens as the size of the SMEs increases. In other words, interpersonal connections become increasingly important as the enterprise size gets larger. Table A5.3 adds another piece of useful information to this analysis. It shows that payment system problems (*cash1=1*) are less important for larger SMEs. For example, as can be seen from Column 6 in Panel I of Table A5.3, if an SME with government connections that is minus 1 s.d. from the mean *lnsales* value, is facing payments system (cash) issues, this will reduce the importance of having government connectedness by 5 per cent. However, for an SME with similar attributes, but with plus 1 s.d. from the mean *lnsales* value, this difference is only 1 per cent. And a similar trend is observed for *bzinplbr*, which can be seen in Panel II of Table A5.3. These results also indicate that, given payment system problems, interpersonal connections become increasingly important as the size of SMEs increases.